

## Impact Evaluation

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### Comments

P-0095/001

I'm worried about the health of the Columbia River and the workers and people who live and work in the area.

### Response

The HSW EIS evaluates health impacts on downstream populations of groundwater reaching the Columbia River over a 10,000-year time frame. The impacts of groundwater reaching the river are discussed in Volume I Section 5.3 and Volume II Appendix G. See also Volume I Sections 5.11 and 5.14 and Volume II Appendixes F and L.

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### Comments

L-0052/009

Ecological evaluation. The ERWM has a concern about potential impacts from 200 Area contaminants entering the groundwater and eventually entering the Columbia River. Assuming that this is a possibility, should this EIS address this issue and talk about potential impacts to the riparian zone, river, and impacts on endangered species such as salmon?

THR-0005/001

I, too, wonder about the salmon and the elk. The salmon as they goes down the Columbia River out to the ocean and what the overall effect it [water contamination] has.

TPO-0010/003

What about the animals that have been mentioned before? What about the birds and the fish? The food chain? We can't impact our environment without impacting the whole interconnection of life itself. That's what we're talking about.

TPO-0011/002

I am worried about us and the other animals.

TSE-0022/002

Already the fish in the Columbia River are so poisonous that people eating these fish face a big risk of cancer. Tribal children in particular face, according to the EPA, a one in 50 chance of getting cancer from eating fish. That's generally in the Columbia River. At Hanford, it is the most contaminated, chemically contaminated, of course radiologically contaminated fish in the Columbia River. This isn't discussed in the EIS.

TSE-0026/001

The DOE's own model of current and projected groundwater contamination at Hanford is a terrifying death sentence predicting preventable cancer deaths among people and animals, fish and birds, who will be exposed to contaminated groundwater for years.

### Response

The human exposure scenarios described in Volume II Appendix F consider direct and indirect use of the Columbia River water and biota (e.g., swimming, consumption of fish). For those radiological and non-radiological contaminants that will reach the Columbia River bioaccumulation of contaminants and resulting impacts to non-human biota are also expected to be small. See Volume I Sections 5.5 and 5.11, and Volume II Appendix F and Appendix I.

The EPA Columbia River Basin Fish Contaminants Survey 1996-1998 (EPA 2002) was a study of organic, metal, and radionuclide concentrations in 208 fish tissue samples collected from 24 locations on the Columbia, Snake, Yakima, Clearwater, Klickitat, Deschutes, Willamette and other rivers that drain the

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Columbia River Basin. Locations included the Hanford Reach of the Columbia River, artificial ponds on the Hanford Site, and the upper Snake River. Cancer risks were estimated for consumption of fish that were contaminated with radionuclides. These risks were small relative to the estimated risks associated with radiation from naturally occurring background sources, to which everyone is exposed. The levels of radionuclides in fish tissue from the Hanford Reach of the Columbia River and the ponds on the Hanford Site were similar to levels in fish from the Snake River. These estimates of risks were not combined with the potential risks from other chemicals, such as PCBs (Aroclors and dioxin-like PCBs), chlorinated dioxins and furans, and a limited number of pesticides. The potential cancer risks from consuming fish collected from Hanford Reach and the artificial ponds on the Hanford Site were similar to cancer risks in fish collected from the upper Snake River. EPA reported that the Yakima River and the Hanford Reach of the Columbia River tended to have higher concentrations of organic chemicals than other study sites. EPA also reported that the chemicals and/or chemical classes that contributed the most to cancer risk for most of the resident fish were PCBs (Aroclors and dioxin-like PCBs), chlorinated dioxins and furans, and a limited number of pesticides. For most of the anadromous fish, the chemicals that contributed the most to cancer risk were PCBs (Aroclors and dioxin-like PCBs), chlorinated dioxins and furans, and arsenic. These chemicals occur in the Columbia River as a result of agricultural and industrial operations (pulp and paper plants, for example) and are very unlikely to be of Hanford origin. These chemicals would not exist in wastes proposed for future disposal at Hanford, or, if initially present, would be treated to reduce their mobility and toxicity to meet applicable standards prior to disposal.

The ecological impact analysis contained in the HSW EIS is consistent with the requirements of NEPA. It is also consistent with the methods, characteristics, and controls associated with a composite analysis as described by the Columbia River Comprehensive Impact Assessment (CRCIA) team. The analysis modules included in the System Assessment Capability (SAC) parallel those identified by CRCIA and were developed through work group meetings that included regulator and stakeholder participation. Several key modules were adopted directly from the CRCIA including the module used to calculate human health impacts (the HUMAN code) and the module used to calculate impacts to ecological species (the ECEM code).

Volume II Appendix I provides information about potential impacts to terrestrial and aquatic ecological resources that may result from implementation of HSW EIS alternatives. Potential impacts to terrestrial resources were evaluated in the near term (i.e., during waste management operations and under current conditions). Potential impacts would result primarily from surface disturbances associated with excavation and disposal activities. Potential impacts to Columbia River riparian and aquatic resources could occur in the long term, i.e., up to 10,000 years following the conclusion of waste management operations. These would be primarily the result of the eventual migration of radionuclides and other hazardous chemicals through the vadose zone to groundwater and on to the Columbia River. Biological and ecological resources (vegetation, wildlife, aquatic ecology, and threatened and endangered species) potentially impacted by the proposed actions are assessed in Volume II Appendix I and summarized in Volume I Section 4.6. Wildlife and ecological resource impacts are summarized in Volume I Section 5.5.

DOE manages Hanford biological and ecological resources in accordance with the Biological Resource Management Plan (BRMaP; DOE-RL 2001) and the Biological Resource Mitigation Strategy (BRMiS; DOE-RL 2003). See Volume I Section 5.18.8 for discussion of resource management and impact mitigation plans.

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### Comments

L-0014/002, L-0022/002

We do not categorically oppose the importation, treatment, and disposal of wastes from other sites at Hanford, so long as assurance is provided that the wastes can be safely handled and disposed of in accordance with applicable rules and regulations. This must be accomplished without the delay of or budget impacts on Hanford cleanup programs.

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### Response

The HSW EIS evaluates several alternatives for the storage, treatment, and processing of waste from onsite and offsite generators. Evaluations in the WM PEIS, the HSW EIS, and related NEPA documents indicate that additional wastes could be handled at Hanford without complicating future remediations, or diverting resources or disposal capacity from other Hanford cleanup activities.

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### Comments

E-0043/025, EM-0217/025, EM-0218/025, L-0056/025, LM-0017/025, LM-0018/025

Analysis of the cost of waste imports in light of the Hanford site cleanup budget. Will waste import detract from actual Hanford clean-up?

E-0051/004

Any money used to handle/treat outside waste takes away from on-site clean-up.

### Response

The HSW EIS evaluates several alternatives for the storage, treatment, and processing of waste from onsite and offsite generators. Evaluations in the WM PEIS, the HSW EIS, and related NEPA documents indicate that additional wastes could be handled at Hanford without complicating future remediations, or diverting resources or disposal capacity from other Hanford cleanup activities.

DOE requests funds from Congress based on its cleanup schedules.

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### Comments

E-0010/003

And please encourage the USDOE to explore other safe options for storage of this waste... The healthy future of our state depends on it.

E-0047/017

The analyses do not address dangerous waste in Low Level Waste (LLW).

L-0019/006, TSE-0002/006

Full discussion of alternative methods of disposal [is a an open issue in the revised draft.]

L-0033/003

[This EIS must be revised to fully evaluate and share with the public] a comparison of the environmental impacts of radioactive and hazardous waste disposal at different sites; a discussion of the long-term management of this serious threat to human health and the environment[.]

TSE-0010/004

We already have a lot of waste there that needs to be focused on, and that's what the alternatives should have focused on in this Revised Environmental Impact Statement, and it did not do that.

TSP-0007/002

I think it is pretty ridiculous to put populations at risk if there is an alternative. I don't know what the alternatives are.

### Response

The HSW EIS evaluates alternatives for disposal of LLW, MLLW, ILAW, and WTP melters in either independent or combined-use facilities that comply with RCRA and state standards for disposal of hazardous wastes. The alternatives have been configured consistent with the WM PEIS and its records of decision, the HSW EIS notice of intent, and comments received during public review periods. Descriptions of these alternatives are presented in Volume I Section 3. Volume I Figure 3.1 shows the many options possible for

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treatment, storage, and disposal of HSW EIS waste streams. Options include a No Action Alternative, waste disposal in LLBG trenches, waste disposal in the Environmental Restoration Disposal Facility (ERDF) and in ERDF-like mega-trenches at various locations, use of lined and capped facilities that would comply with Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste requirements, and disposal of LLW in lined trenches with leachate collection systems that would meet the substantive requirements of federal and state hazardous waste management regulations. The HSW EIS does not evaluate any alternatives for the disposal of MLLW in trenches that are not lined and that do not fully meet RCRA Subtitle C requirements. The potential environmental impacts of the HSW EIS alternatives are presented in Volume I Section 5 and related Volume II appendixes.

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### Comments

L-0016/017

Long term plans can't be made about materials whose long-term survival is unknown (e.g. asphalt, or concrete).

L-0029/004

All containment designs will eventually fail sending dangerous poisons into the Columbia River.

L-0033/009

...install a weatherproof cap [over the burial trenches.]

L-0055/031

In most of the alternatives, a cap would be placed over waste sites consisting of soil, sand, gravel, and asphalt to reduce water infiltration, and human and animal intrusion. A cap made of these materials would do little to limit intrusion by humans. In addition, the life of these caps would be no greater than a few hundred years. The half life of some contaminants is much longer than this. There have already been occurrences of animal intrusion in areas with caps over waste sites. Landfills have used caps made of artificial materials. This is not considered at these sites. These artificial materials would very visually show when the ground is starting to erode and exposing the capping material.

L-0055/068

The long-term performance of our in-place waste site remedies and closure techniques is largely unproven. This is also a large area of uncertainty. For example, if the caps over the waste sites break down sooner than they predicted, then the waste will flow into the ground water quicker and at high radioactivity levels than they predicted using the SAC. It is well known that the caps over the waste sites will not last as long as the waste under them remains intrinsically dangerous. The waste stored at Hanford should be stored in containers or stabilized in a form with a lifespan as least as long as the waste form remains intrinsically dangerous. Otherwise, it is just a delay in the inevitable release of new contaminants. As an alternative, the waste could be kept in frequently monitored, easily retrievable locations.

THR-0008/004

So, this business of capping, capping is supposedly going to be a way of handling these dump sites, is just what it is. It's a veneer, a mask. Nothing is said about, you know, what's happening, where's the material in the ground go after the water gets to it? You put a hard cover on it, that means nothing.

TPO-0008/003

Has the EIS addressed all potential containment failures estimated over the next 50 to a hundred years?

TPO-0024/001

I just think these caps are just, you know -- it's just a cover-up, because -- so rain comes down the side of the cap, right? Well, what we know is soil isn't just like evenly dispersed, like a nice little sand pile. But there's columns and there's cracks and there's vertical as well as horizontal ways that things flow underground. And so to say that the only reason these -- you know, that's even more shocking that these liners are only about

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when it's not capped.

TPO-0025/001

However, it's commonly known, inside of NORAD, that about a week after it rains outside, it rains in NORAD [a facility several hundred feet underground in the mountains in Colorado Springs, under granite]. I was there it was raining on me. Sunny outside, raining in NORAD. So if you have a mountain that's several hundred feet high in granite -- designed for nuclear blasts, that kind of thing, I mean, it's a military facility -- I find it very difficult that these caps are going to be really effective at really mitigating thunderstorms, gully washes, things like this.

### Response

The HSW EIS barrier performance analysis takes into account degradation of the modified RCRA Subtitle C barrier. No guidance is available for specifying barrier performance after the design life. However, it is likely that this specific barrier will perform as designed far beyond its design life. The modified RCRA Subtitle C barrier (see Volume I Section 2.2 for description of this barrier) has a design life of 500 years in the absence of any active institutional controls or maintenance 100 years after closure. The starting infiltration rate used in the release modeling begins at 0.01 cm/yr, after which the assumed rate increases in five steps over 500 years after the start of cover degradation (See Volume II Figure G.3). After 500 years of degradation, the infiltration rate used in the release modeling is assumed to be equivalent to the rate used to represent recharge for the natural surrounding environment (0.5 cm/yr). This rate was used during the remaining 9,000 years of this assessment. Groundwater impacts based on these assumptions are in Volume I Section 5.3 and Volume II Appendix G. A sensitivity analysis was also performed that assumed the cap would be maintained beyond 100 years after closure. Groundwater impacts from this sensitivity analysis are in Volume II Appendix G Section G.4.

The HSW EIS evaluates impacts to the Columbia River and downstream populations for about 10,000 years. For all alternatives analyzed in this HSW EIS, DOE has analyzed the long-term movement of contaminants through soil and groundwater to the Columbia River. In all cases, it found that the water quality of the Columbia River would be virtually indistinguishable from the current river background levels. The concentrations of all the constituent contaminants were well below benchmark drinking water standards at a hypothetical well located near the Columbia River. The impacts of groundwater reaching the river are discussed in Volume I Sections 5.3 and Volume II Appendix G. See also Volume I Section 5.11 and 5.14 and Volume II Appendixes F and L.

Doses for intrusion scenarios at 10,000 years after disposal-site closure have been calculated and are included in the EIS.

Barriers over the contamination sources are used to inhibit radionuclide transport to the surface environment through deep rooted plants, such as Russian thistle, or burrowing insects and animals. There are components in the modified RCRA Subtitle C Barrier, illustrated in Volume I Section 2.2.3.2, to exclude burrowing insects/mammals and deep rooted plants from coming in contact with the waste. Details regarding surface contamination are documented in the Hanford Site Environmental Report 2001 (Poston et al. 2002).

Information about caps and barriers is presented in Volume I Section 2 and Volume II Appendix G.

DOE does not and will not rely solely on long-term stewardship to protect people and the environment. As indicated in the DOE sponsored report "Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites" (National Research Council 2000), "contaminant reduction is preferred to contaminant isolation and the imposition of stewardship measures." Contaminant reduction is a large part of the ongoing cleanup efforts at Hanford. Most of the analyses in the HSW EIS are based on the assumption that long-term institutional controls would no longer be in effect 100 years after closure (about 2150 AD). Long-term groundwater impacts and subsequent human health impacts were determined based on the assumption that caps would degrade and eventually provide no protection (see Volume I Sections 5.3 and 5.11 and Volume II

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Appendices F and G). In addition, "intruder scenarios" are analyzed to determine the impacts of gaining access to the site (i.e., no institutional controls) and digging or drilling into waste sites. See Volume I Section 5.11.2.2 and Volume II Appendix F Section F.3. Further information on DOE's long-term stewardship activities can be found in the DOE Long-Term Stewardship Study (DOE 2001a). The discussions of long-term stewardship in Volume I Sections 2.2.7 and 5.18 of the HSW EIS have been revised in response to comments.

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### Comments

E-0043/015, EM-0217/015, EM-0218/015, L-0056/015, LM-0017/015, LM-0018/015

In selecting Alternative D as the preferred alternative, DOE should state 1) the cost savings of Alternative D over the other alternatives; 2) the land use savings of Alternative D over the other alternatives; 3) the risks associated with Alternative D over the other alternatives; and 4) the environmental advantages and disadvantages of Alternative D over the other alternatives.

L-0049/004

Second, the environmental consequences chapter reveals few differences among adopting different action alternatives. This limits the decisionmaker's and readers' ability to clearly distinguish between alternatives. CEQ NEPA Regulations at 40 CFR 1502.14 state that the affected environment and environmental consequences should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining issues and providing a clear basis for choice among the options by the decision-maker and the public. The EIS should present analyses extending beyond that found in the revised draft document. Complementary analyses should represent a range of assumptions and uncertainties and identify the most realistic predictions. The inclusion or absence of mitigation measures with the associated effectiveness of these measures included in the effects' analyses would also help define issues and provide a clearer basis for choice.

### Response

Volume I Section 3.4 of the HSW EIS provides tables, graphics, and text discussion to summarize and compare the impacts of the alternatives. Volume I Section 3.6 discusses costs.

As a result of additional mitigation measures incorporated into the action alternatives, the impact of the proposed action on groundwater at the 1-km line of analysis would be below benchmark drinking water standards. The discussion of Irreversible and Irretrievable Commitments of Resources in Volume I Section 5.15 has been revised in this EIS.

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### Comments

E-0043/023, EM-0217/023, EM-0218/023, L-0056/023, LM-0017/023, LM-0018/023

Analysis of groundwater impact by all radionuclides "due to uncertainties in the inventory and modeling approach." These uncertainties need to be addressed, and a cumulative impact analysis of the impact on the groundwater by all radionuclides should be performed.

### Response

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

The LLBGs contain over 100 radioactive and non-radioactive constituents that potentially could impact groundwater. Screening of these constituents considered a number of aspects that included (1) their potential for dose or risk, (2) their decay or degradation rates, (3) their estimated inventories, and (4) their relative mobility in the subsurface system within a 10,000-year period of analysis. Establishing the relative mobility

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of each contaminant, they were grouped based on their mobility in the vadose zone and underlying unconfined aquifer. Contaminant groupings were used, rather than the individual mobility of each contaminant, primarily because of the uncertainty involved in determining the mobility of individual constituents. The waste constituents were grouped according to estimated or assumed  $K_d$  of each constituent.

Based on an assumed infiltration rate and estimated levels of sorption and associated retardation, the estimated travel times of a number of constituents through the thick vadose zone to the unconfined aquifer beneath the LLBGs were calculated well beyond the 10,000-year analysis. Thus, these constituents were eliminated from further consideration. Of the remaining constituents, technetium-99, iodine-129, carbon-14, and uranium isotopes were considered of sufficient quantity and mobility to warrant detailed analysis of groundwater impacts. Selenium and chlorine, while mobile, were screened out because their total inventories were less than 0.01 Ci. Tritium and cesium were not evaluated because of their relatively short half-lives. Plutonium was screened out because of its lack of mobility.

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### Comments

L-0055/011

The variability in human dose with regard to individual behavior and exposure affects the uncertainty even more than the inventory, release, or environmental transport. It is for these uncertainties that the environment must be protected to safeguard the populations living in this area in the future. This is why the Native American Subsistence Scenario (NASS) is important to be used in this EIS. Water quality was evaluated via an annual dose from a worker drinking 2 liters per day of the ground water. As addressed in the NASS, this amount may seem low. Drinking 3 liters per day may be more representative of a Native American or resident gardener for this area.

### Response

The CRCIA (DOE-RL 1998) was a study initiated by DOE, Ecology, and EPA to assess the effects of Hanford-derived materials and contaminants on the Columbia River environment, river-dependent life, and users of river resources for as long as these contaminants remain intrinsically hazardous. CRCIA was developed to provide screening, impact, and risk assessment procedures to be used under the Hanford TPA, the RCRA, and CERCLA programs. The approach taken in the HSW EIS is consistent with the methods, characteristics, and controls associated with a composite analysis as described by the CRCIA team. Key elements of the approach include ensuring that factors that will dominate the risk are included and providing an understanding of the uncertainty of the results. Dominant factors were identified through scoping studies and the development of conceptual models for each of the analysis modules used. A stochastic modeling approach was taken to estimate uncertainty in the results. Aspects of uncertainty that could not be included in the calculation were considered in the analysis of the modeling results and discussed in the document presenting those results (Bryce et al. 2002). The analysis modules included in the System Assessment Capability parallel those identified by CRCIA and were developed through work group meetings that included regulator and stakeholder participation. Several key modules were adopted directly from the CRCIA including the module used to calculate human health impacts (the HUMAN code) and the module used to calculate impacts to ecological species (the ECEM code).

EPA safe drinking water standards are based on consumption of 2 liters of water per day. The onsite residence scenarios are hypothetical cases presented solely to provide comparative impacts to such a hypothetical individual. Consistent with Volume I Section 5.15, DOE intends to maintain appropriate restrictions on groundwater usage for as long as necessary. Concentrations in the Columbia River from the proposed action are expected to be indistinguishable from current river background levels. Therefore, assuming consumption of 3 liters per day would not change the conclusions in the EIS.



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### Comments

E-0047/033

Uranium is scheduled to be regulated as a toxic metal rather than as a radioactive element and should be assessed as such.

L-0041/050

In December 2003, uranium is scheduled to be regulated as a toxic metal rather than as a radioactive element. DOE should incorporate this change in regulatory status in both the final EIS and subsequent ROD.

### Response

The HSW EIS risk assessment evaluates both radiological and non-radiological uranium toxicity.

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### Comments

E-0019/004, L-0026/004

The draft HSW-EIS has failed to evaluate the inventory and environmental impact of hazardous chemicals and has evaluated radionuclides only. The HSW-EIS should provide projected hazardous or dangerous waste inventories. Effective December 8, 2003, uranium will have a standard of 0.03 mg/L, based on chemical toxicity that is more restrictive than the radiological dose standard. The containerized grout supplemental technology may result in ground water concentrations of nitrate and nitrite greater than the regulatory limit. Evaluation of uranium, nitrate, nitrite, and other applicable hazardous or dangerous component concentrations in the groundwater should be provided in addition to uranium contribution to the calculated dose.

### Response

The HSW EIS risk assessment evaluates both radiological and non-radiological uranium toxicity.

ILAW disposal has been evaluated in the HSW EIS based on the expectation that it will be a borosilicate waste form. Outside the scope of the HSW EIS, DOE has been considering adjustments to the ILAW waste form and its chemical and radionuclide composition. It is expected that potential environmental impacts associated with such changes in the ILAW waste form will be evaluated in the Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single Shell Tanks at the Hanford Site (68 FR 1052).

Hazardous chemicals in MLLW have been characterized and documented since the implementation of RCRA at DOE facilities beginning in 1987. MLLW currently in storage, and MLLW that may be received in the future, would be treated to applicable state or federal standards for land disposal. Therefore, disposal of that waste is not expected to present a hazard over the long term because the hazardous constituents would either be destroyed or stabilized by the treatment. Inventories of hazardous materials in stored and forecast waste are either very small, or consist of materials with low mobility. See Volume II Appendixes F and G.

Inventories of hazardous chemicals in waste were not generally maintained by industries in the United States prior to the implementation of RCRA. Consistent with these general practices, inventories of hazardous chemicals in radioactive waste were not required to be determined or documented before the application of RCRA to radioactive mixed waste at DOE facilities in late 1987. Wastes placed in the LLBGs before late 1987 have not been specifically characterized for hazardous chemical content, but they have been evaluated in the EIS alternatives relative to their radionuclide inventories. In addition, preliminary estimates of chemical inventories in this waste have been developed for analysis in the HSW EIS, and a summary of their potential impacts on groundwater has been added to Volume I Section 5.3 and Volume II Appendix G.

In addition, the October 23, 2003 Settlement Agreement contains proposed milestones in the M-91-03-01 Tri-Party Agreement Change Package for retrieval and characterization of suspect TRU waste retrievably stored



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in the Hanford LLBGs (United States of America and Ecology 2003). As part of that agreement, DOE will manage the retrievably stored LLBG waste under the following assumptions: (1) all retrievably stored suspect TRU waste in the LLBGs is potentially mixed waste; and (2) retrievably stored suspect TRU waste will be managed as mixed waste unless and until it is designated as non-mixed through the WAC 173-303 designation process.

Interactions among different types of waste that could potentially mobilize radionuclides have also been considered as part of the HSW EIS analysis. However, such interactions typically require specific chemical environments or large volumes of liquid as a mobilizing agent, neither of which are known to be present in the solid waste disposal facilities currently in use (see discussion in Volume II Appendix G). Possible effects of this type could be mitigated by selecting candidate disposal sites to avoid placing waste in locations where previous contamination exists.

Waste sites and residual soil contamination remaining at Hanford over the long term, and which are not specifically evaluated as part of the HSW EIS alternatives, have been evaluated previously as part of NEPA or CERCLA reviews. In those studies, the risks associated with older solid waste burials, tank waste residuals and leaks, and contaminated soil sites were found to be very small, even for alternatives that considered stabilization of the waste in place (DOE 1987, DOE and Ecology 1996, Bryce et al. 2002). Further evaluation of tank wastes is anticipated in the "Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single-Shell Tanks at the Hanford Site" (68 FR 1052). The cumulative groundwater impacts analysis in the HSW EIS also includes those wastes, as described in Volume I Section 5.14 and Volume II Appendix L.

DOE plans to characterize pre-1970 inactive burial grounds and contaminated soil sites, as well as the active LLBGs considered in the HSW EIS alternatives, under the RCRA past practice or CERCLA processes to determine whether further remedial action would be required before the facilities are closed. As part of that process, the long-term risks from these wastes would either be confirmed to be minimal, or the waste would be remediated by removal, stabilization, or other remedial actions to reduce its potential hazard. In all cases, the impacts from these previously disposed wastes would be the same for all alternative groups considered in the HSW EIS, and would not affect the comparisons of impacts among the alternatives or the decisions made regarding disposal of waste received in the future.

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### Comments

TSE-0012/004

The EIS does not address the interaction of hazardous chemicals such as carbon tetrachloride, the interaction with the radioactive chemicals. This is a serious and fatal flaw in the EIS.

### Response

Discussion of the synergistic transport effects among organic and inorganic contaminants is provided in Volume I Section 5.3 and Volume II Appendix G. To establish the relative mobility of each contaminant, they were grouped based on their mobility in the vadose zone and underlying unconfined aquifer. Contaminant groupings were used, rather than the individual mobility of each contaminant, primarily because of the uncertainty involved in determining the mobility of individual constituents. The groups were selected based on relatively narrow ranges of mobility, and constituents were placed in the more mobile group when there was uncertainty concerning which group they should be placed in. Some of the constituents, such as iodine and technetium, would move at the rate of water whether in the vadose zone or underlying groundwater. The movement of other constituents in water, such as americium and cesium, would be slowed or retarded by the process of sorption onto soil and rock.

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### Comments

E-0055/005

USDOE fails to consider the impact of reasonably foreseeable fires or earthquakes involving wastes, especially TRU, stored now or proposed to be added to, the CWC. The CWC is really nothing more than light metal sheds with concrete floors. The WMPEIS and WIPP SEIS II predicted that an earthquake at Hanford would cause a release of Plutonium and other radionuclides from TRU imported to Hanford and stored in a designed storage facility, resulting in offsite fatal cancers. USDOE seeks to add more room for imported TRU by removing waste to ERDF without any consideration of the impacts of using CWC for storage of TRU

TSE-0028/004

In the event of an earthquake, the Waste Management Programmatic EIS said the number of latent cancer fatalities ranged to 200 at Hanford from the quantities of transuranic waste proposed to be imported, and said that the impacts of this will have to be considered in a site specific Environmental Impact Statement, and mitigation measures taken into account. Any future decisions regarding transfers of transuranic waste would be subject to appropriate review and the agreements DOE's entered into, and as Judge McDonald said, although DOE intends to select sites the Waste Management PEIS will not be the basis of selecting locations, and there will be a site specific review of all the impacts and the specific mitigation measures, including both the earthquake, the accidents, and the treatment required of imported transuranic waste. All of those things are missing from this EIS[.]

### Response

Accident impacts are evaluated in Volume I Section 5.11.1 and Volume II Appendix F Section F.2. Scenarios include earthquake, fire, and explosion.

The HSW EIS evaluates the consequences of various site-specific alternatives to the ongoing waste management program at Hanford, consistent with WM PEIS decisions regarding certain TRU, LLW, and MLLW streams. A discussion of the WM PEIS and other NEPA review documents relevant to the HSW EIS can be found in Volume I Section 1.5.

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### Comments

L-0055/046

DOE's ground water flow directions do not match some of the historical ground water flow directions. It is possible that there are different flow directions depending on the time scale used in the analysis. The regional flow has traditionally been to the south east. It is possible that this has changed with time as the mounding has dissipated, but it must still be evaluated as a contingency depending on the use of the land surface in the future. The ground water flow paths may still be in a state of flux since there is uncertainty in flow directions. In addition, the danger or radionuclide concentrations are much higher for a Native American practicing their traditional way of life.

### Response

Given the expected long delay of contaminants reaching the water from the LLBGs, the hydrologic framework of all groundwater transport calculations was based on postulated post-Hanford steady-state water table as estimated with the three-dimensional model. These conditions would only reflect estimated boundary condition fluxes (for example, natural recharge and lateral boundary fluxes) and not the effect of past and current wastewater discharges on the unconfined aquifer system that are seen in current conditions. The current version of the sitewide model relies on a three-dimensional representation of the aquifer system that was calibrated to Hanford sitewide groundwater monitoring data collected during Hanford operations from 1943 to the present. The calibration procedure and results for this model are described in Cole et al. (2001b). This recent work is part of a broader effort to develop and implement a stochastic uncertainty estimation methodology in future assessments and analyses using the sitewide groundwater model (Cole et al. 2001a). The resulting distribution of hydraulic conductivities from this recent calibration effort is provided in Figures

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G.11 and G.12 in Volume II Appendix G of this HSW-EIS. DOE believes that modeling procedures and values used are consistent with those applied in the RCRA and CERCLA context at Hanford. The assessment benefits from preceding analyses and field observations, including the performance assessments for 200 West and 200 East post-1988 burial grounds (Wood et al. 1995, 1996), the remedial investigation and feasibility study of the ERDF (DOE-RL 1994), the disposal of ILAW originating from the single- and double-shell tanks (Mann et al. 1997) and (Mann et al. 2001), and the Composite Analysis of the 200 Area Plateau (Kincaid et al. 1998). These and other analyses, (for example, environmental impact statements) included development of inventory data and application of screening or significance criteria to identify the radionuclides that could be expected to substantially contribute to either the dose or risk calculated in the respective analysis. Clearly, those radionuclides identified as potentially significant in these published analyses are also expected to be key radionuclides in this assessment.

As stated in Volume I Section 6.13, none of the activities involved in the HSW EIS would occur on open and unclaimed lands.

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### Comments

L-0041/031

Groundwater modeling is predicated on an infiltration rate that increases with time. That is to say for the first 500 years DOE uses an infiltration rate of 0.01 cm/yr. This is reflective of an assumption about the system constructed to contain the waste. Between 500 years and 1,000 years, the infiltration rate increases to 0.5 cm/yr., which is thought to mimic cover failure. Beyond 1,000 years infiltration is modeled at 0.5 cm/yr. This is a coarse assumption, which should drive a requirement for a field-scale test to verify infiltration rates. Secondly, this assumption should drive the need to plan redundant systems to assure meeting this modeling input, thus meeting expected performance parameters.

### Response

Infiltration rates were based on field testing. Infiltration rate assumptions used in the groundwater analysis are contained in Volume II Appendix G, Section G.1.

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### Comments

L-0039/011

K-Basins sludges [are not adequately analyzed in this EIS.]

### Response

The HSW EIS evaluates the impacts of K Basin sludge that will be stored, processed, and certified onsite prior to shipment to WIPP for disposal.

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### Comments

L-0041/039

Using four classes of Kds in the EIS appears appropriate for analyzing potential future risks, however the assignment of contaminants in the groups should be revised, based on the minimum known Kds for each contaminant. Using a minimum Kd will be conservative in that the contaminant(s) will be more readily released from the source term, which will tend to elevate risks in groundwater. For example, the SAC model included high estimates for the Kd values for neptunium. The observed Kd for neptunium at Hanford is typically about 2.5, making it highly mobile and a major risk driver.

### Response

The Kd data used in the HSW EIS are based on site-specific analysis of adsorption and are consistent with general observations of contaminant mobility at Hanford.

## Impact Evaluation

The HSW EIS has benefited from preceding analyses and field observations, including the performance assessments for 200 West and 200 East post-1988 burial grounds (Wood et al. 1995, 1996), the remedial investigation and feasibility study of the ERDF (DOE-RL 1994), the disposal of ILAW originating from the single- and double-shell tanks (Mann et al. 1997) and (Mann et al. 2001), and the Composite Analysis of the 200 Area Plateau (Kincaid et al. 1998). These and related environmental analysis documents have provided inventory data and screening or significance criteria to identify those radionuclides that could be expected to substantially contribute to either the dose or risk calculated in the respective analysis. The radionuclides identified as potentially significant in these published analyses are also expected to be key radionuclides in this assessment.

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### Comments

TSE-0031/004

It [the DEIS] does not include nuclear reactors from the Navy.

### Response

The naval reactor compartments disposal is discussed as part of the cumulative impacts analysis. See Volume I Section 5.14 and Volume II Appendices G and L.

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### Comments

L-0044/018

Volume 3.5 Appendix L.2.8: Uncertainty is addressed in volume I (3.5) and volume II (L.2.8). Specifically, overall causes of error between modeled and observed data, uncertainty due to using different models, also natural variability and possible uncertainty due to lack of characterization are not addressed. This uncertainty needs to be addressed in some manner that explains the extent of its significance to this project. Uncertainty has been explained in the SAC. The September 2002, PNNL-14027 "An Initial Assessment of Hanford Impact Performed with the System Assessment Capability" document addresses uncertainty by determining the model parameters that contribute the most variability. An approach similar to this would be helpful in grasping the significance of variability with all the modeling parameter and data or lack of data used.

Ecology encourages the USDOE to incorporate the discussion of uncertainty in the Final SW EIS. Ecology supports National Council on Radiation Protection and Measurements publication no. 14, "A Guide for Uncertainty Analysis in Dose and Risk Assessments Related to Environmental Contamination," dated May 10, 1996. "Incorporating uncertainty analysis into a dose or risk assessment provides an essential ingredient for decision-making."

L-0044/126

The HSW-EIS SAC analysis does not address uncertainty due to the use of different models, nor does it differentiate between uncertainty due to lack of knowledge and the uncertainty due to natural variability in the parameters. The current uncertainty analysis identifies controlling sources of variability in the simulation estimates of performance measure, but not necessarily the source of overall magnitude of performance measure. The analysis should address the source of overall magnitude of uncertainty, as well as uncertainty due to lack of knowledge and natural variability in the parameters.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in

## Impact Evaluation

Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

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### Comments

L-0055/055

The ESTP staff is uncertain about the nature and extent of some sources and types of contamination. The inventory of iodine-129 is uncertain by up to a factor of 2, and thus, so are the associated cumulative effects. Yet it is also stated that the cumulative impacts to the groundwater from the iodine-129 could be greater than the impacts presented in this EIS by a factor of up to 3. It again appears to be some discrepancies in these broad assumptions.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

The evaluations in the HSW EIS were prepared using accepted standard methodologies, such as "Federal Guidance Report 13 Cancer Risk Coefficients for Environmental Exposure." DOE and EPA use FRG-13 for radiological risk assessment. EPA also uses FRG-13 and related guidance for chemical exposure health impact analysis in its Integrated Risk Information System (IRIS). See Volume I Section 5.11 and the Volume II appendices for more discussion on methodologies used in the HSW EIS.

Iodine-129 inventories have been estimated and included in the cumulative groundwater impacts analysis. See Volume I Section 5.14 and Volume II Appendix L.

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### Comments

E-0043/073, EM-0217/073, EM-0218/073, L-0056/073, LM-0017/073, LM-0018/073

Another example is the assumption that active institutional controls will be absent 100 years after site closure, and that caps and covers will not be maintained, and monitoring will not be performed. These assumptions set a dangerous precedent, regardless of what DOE claims the federal government intends to do. HSW EIS analysis requires accurate, quantitative data so that truly informed choices can be made. A full, quantitative EIS analysis is required on the issues of site closure and active institutional control stoppage. No assumptions can be made regarding those issues without a full quantitative EIS analysis. If DOE wishes to continue using this 'assumption' within the present HSW EIS, then DOE should treat this 'assumption' as separate action alternative, and give it full, quantitative EIS analysis now.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

DOE does not and will not rely solely on long-term stewardship to protect people and the environment. As

## Impact Evaluation

indicated in the DOE sponsored report "Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites" (National Research Council 2000), "contaminant reduction is preferred to contaminant isolation and the imposition of stewardship measures." Contaminant reduction is a large part of the ongoing cleanup efforts at Hanford. Most of the analyses in the HSW EIS are based on the assumption that long-term institutional controls would no longer be in effect 100 years after closure (about 2150 AD). Long-term groundwater impacts and subsequent human health impacts were determined based on the assumption that caps would degrade and eventually provide no protection (see Volume I Sections 5.3 and 5.11 and Volume II Appendices F and G). In addition, "intruder scenarios" are analyzed to determine the impacts of gaining access to the site (i.e., no institutional controls) and digging or drilling into waste sites. See Volume I Section 5.11.2.2 and Volume II Appendix F Section F.3. Further information on DOE's long-term stewardship activities can be found in the DOE Long-Term Stewardship Study (DOE 2001a). The discussions of long-term stewardship in Volume I Sections 2.2.7 and 5.18 of the HSW EIS have been revised in response to comments.

The HSW EIS barrier performance analysis takes into account degradation of the modified RCRA Subtitle C barrier. No guidance is available for specifying barrier performance after the design life. However, it is likely that this specific barrier will perform as designed far beyond its design life. The modified RCRA Subtitle C barrier (see Volume I Section 2.2 for description of this barrier) has a design life of 500 years in the absence of any active institutional controls or maintenance 100 years after closure. The starting infiltration rate used in the release modeling begins at 0.01 cm/yr, after which the assumed rate increases in five steps over 500 years after the start of cover degradation (See Volume II Figure G.3). After 500 years of degradation, the infiltration rate used in the release modeling is assumed to be equivalent to the rate used to represent recharge for the natural surrounding environment (0.5 cm/yr). This rate was used during the remaining 9,000 years of this assessment. Groundwater impacts based on these assumptions are in Volume I Section 5.3 and Volume II Appendix G. A sensitivity analysis was also performed that assumed the cap would be maintained beyond 100 years after closure. Groundwater impacts from this sensitivity analysis are in Volume II Appendix G Section G.4.

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## Comments

E-0044/003

More over, at the last meeting of the Groundwater/Vadose Zone Expert Panel, DOE's contractor presented a graphical representation of the health risk that a person would be exposed to if they were to drink two liters of water a day of water from various places on site over the next thousand years. That analysis contained a large though not dominant error. The analysis showed immense radiologic risks exceeding 400 millirem per year over much of the site.

The EIS does not reveal this earlier analysis or discuss the changes made to the model that reduce this risk by a factor of approximately 1,000 fold. This first analysis was based on DOE and DOE's contractors best evaluation of the data. Once the data was used and the analysis was completed, DOE changed the parameters used in the model. This is an invalid approach to modeling and provides no confidence that the model has anything whatsoever to do with reality.

E-0047/002

The EIS generally fails to provide the type of site-specific and high quality analysis required by NEPA. The EIS fails to adequately disclose and describe the direct, indirect and cumulative effects of the proposed alternatives. The EIS fails to properly disclose the effects of existing contamination at Hanford or clearly identify the magnitude of uncertainties or potential effects that may occur under the proposed alternatives.

E-0055/021

DOE asserts that the parameters used in its models are conservative. The numerical models used have not been validated, and are in conflict with site observations on the movement of wastes. EPA requires that site specific parameters be used in models. The parameters used in the model do not appear to reflect the best site

## Impact Evaluation

knowledge of these parameters.

L-0044/005

The lack of inventory data leads to improper assessment of risk and impact to the environment.

L-0054/011

Fourth, characterization and inventory of waste streams is incomplete which contributes to a flawed assessment of cumulative impacts.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

An expanded discussion of uncertainties associated with the HSW EIS impact analyses is included in Volume I Section 3.5.

The HSW EIS uses the definition of cumulative impact as defined by the CEQ Regulations (40 CFR 1508.7): "Cumulative impact" is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Potential cumulative impacts associated with implementing the HSW EIS alternative groups are summarized in Volume I Section 5.14. Past, current, and future Hanford activities include treatment and disposal of tank waste, CERCLA remediation projects, previously disposed of waste, decontamination and decommissioning of the Hanford production reactors and other facilities, waste in the PUREX tunnels, operation of a commercial LLW disposal facility by U.S. Ecology, and operation of the Columbia Generating Station by Energy Northwest. Cumulative impacts of storage, treatment, and disposal activities for a range of waste volumes are evaluated and expanded in the final HSW EIS. For most resource and potential impact areas, the combined effects from the alternative groups for the Hanford Only, Lower Bound and Upper Bound waste volumes, or for the No Action Alternative for the Hanford Only and Lower Bound waste volumes, when added to the impacts of these other activities, are small.

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### Comments

E-0043/072, EM-0217/072, EM-0218/072, L-0056/072, LM-0017/072, LM-0018/072

Much of the EIS is based on generalities and assumptions. One example is that the EIS uses that assumption that the WIPP will receive remote-handled waste "within the 2005 timeframe." An accurate analysis cannot be performed without a more accurate date. Further, all possible impacts cannot be quantitatively determined without an analysis of other possible dates, including the possibility that the plant will not accept the waste at all.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section



## Impact Evaluation

5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

These TRU wastes are not expected to be stored onsite for an extended period of time. However, they are expected to be stored above ground at the Central Waste Complex and T Plant and (in the case of remote handled, non-mixed TRU waste) underground in concrete boxes so that they will have no contact with the soil. The storage of these wastes will be monitored in compliance with applicable RCRA, State of Washington dangerous waste regulations, and/or DOE requirements.

EPA authorization to dispose of RH-TRU waste at WIPP is pending. Approval of the permit by New Mexico Environment Department is expected in the FY 2006 timeframe.

EPA has granted WIPP authorization to dispose of polychlorinated biphenyls (PCBs). In March 2002, WIPP applied for changes to its permit to allow it to dispose of waste containing PCBs. Approval of the permit revision by the New Mexico Environment Department is pending. Based on the assumption that the changes will be accepted, PCB treatment would not be required. See Volume I, Section 2.1.3.

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### Comments

E-0043/062, EM-0217/062, EM-0218/062, L-0056/062, LM-0017/062, LM-0018/062

The HWS EIS neglects to consider many necessary issues, including how best to analyze the impact of the imported waste and even what waste is under DOE'S jurisdiction.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The impact evaluation models (groundwater, air, exposure, transportation) are discussed in Volume I Section 5 and the Volume II appendices. The assessments in the HSW EIS are based on the data and assumptions used in these models. Limitations and uncertainties in modeling, data, and assumptions are discussed in Volume I Section 3.5 and throughout the HSW EIS Volumes I and II.

Hanford is part of a nationwide cleanup effort of over 100 DOE sites and cooperates with these sites in the cleanup. As part of that effort, Hanford would receive some LLW, MLLW, and would temporarily store some TRU waste from other DOE sites, as well as send HLW, spent nuclear fuel, and TRU waste to other DOE sites. The HSW EIS evaluates a range of waste receipts at Hanford to encompass the uncertainties regarding quantities of waste that would ultimately be managed at the site. The waste volumes evaluated include a Lower Bound waste volume consisting mainly of Hanford waste, and an Upper Bound volume that includes additional quantities of offsite waste that Hanford might receive consistent with WM PEIS decisions. The HSW EIS includes an evaluation of Hanford Only waste. The Hanford waste evaluation provides a basis with which to determine the impacts of varying quantities of offsite waste at Hanford. Evaluations in the WM PEIS, the HSW EIS, and related NEPA documents indicate that additional wastes could be handled at Hanford without complicating future remediations, or diverting resources or disposal capacity from other Hanford cleanup activities. Information on the potential impacts of transporting waste has been revised and is presented in Volume I Section 5.8 and Volume II Appendix H.

## Impact Evaluation

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### Comments

L-0041/038

Use of the single portioning coefficient value (Kd) overlooks the complexity of the system of release action that may be occurring. It is likely that for each contaminant, Kd is multi-dimensional with discrete values existing within the waste form, in the vadose zone and then in groundwater. In those release instances where an extreme chemistry can be associated with the composition of the release, it is likely additional Kd values should be incorporated. Oregon expects that DOE will demonstrate, through appropriate field and laboratory investigations, that the values used in numerical models are conservative.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

What has been observed in the vadose zone beneath the Hanford tank farms were the results of leaks of large volumes of tank wastes containing extreme geochemical conditions of pH and salt content. The enhanced migration of complexed cobalt-60 originated from a discharge site in the B-BX-BY WMA that received large amounts of liquid wastes. LLBGs have not received tank wastes nor have they received large volumes of liquid wastes and there is no evidence that similar geochemical conditions persists beneath LLBGs.

The System Assessment Capability (SAC) has been designed as a stochastic capability with an option to perform deterministic simulations. SAC is a set of computer software tools that enables the user to model the movement of contaminants from all waste sites at Hanford through the vadose zone, groundwater, and the Columbia River, and to estimate the impact of contaminants on human health, ecology, local cultures, and economy. The results of initial runs of the model, including some 1,500 of the 2,100 identified sites, are provided in Volume II Appendix L and Volume I Section 5.14 of this HSW EIS. The SAC model has been through some verification and validation analysis in a process called "history matching" and continues to be developed and tested.

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### Comments

E-0049/010, L-0048/010

In summary, the Board believes that the revised EIS is based on incomplete and inadequate data. We are concerned that, lacking this data, DOE's proposed actions could result in devastating environmental damage to the area, and in particular, to the Columbia River. As a result, we urge DOE to hold off on issuing a final Record of Decision until these analyses can be completed.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

An expanded discussion of uncertainties associated with the HSW EIS impact analyses is included in Volume I Section 3.5.

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### Comments

F-0003/002

...so much of the document is based on assumptions

## Impact Evaluation

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

Inventory data and assumptions are addressed in Volume I Section 3 and Volume II Appendixes B and C. Modeling assumptions are addressed in several appendixes, including Volume II Appendix F for human health and Volume II Appendixes G and L for groundwater.

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### Comments

TPO-0011/008

How many people is it okay to sacrifice? Did they come up with any numbers?

TPO-0026/002

It's fairly clear we don't have modeling that we really can understand the risks that we're dealing with.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The HSW EIS comparison of human health and safety impacts among the alternatives is expressed in terms of worker dose, dose to the public from atmospheric releases, accidents during the operational period, and long-term impacts via the groundwater pathway in the post-closure period. The risks are expressed in many ways, including probability of latent cancer fatalities. Details of the analyses are provided in Volume I Section 5.11 and Volume II Appendix F.

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### Comments

E-0006/001

The US DOE has failed to properly address the human health & environmental impact of adding radioactive waste to Hanford in its Revised Draft Solid Waste Environmental Impact Statement (SW EIS).

F-0002/001

The Environmental Impact Statement adopts a negative definition of health that classifies only severe, clinically recognized forms of injury as health damage. This is derived from the current medical perspective that defines health as the absence of diagnosed disease. If disease or damage has not been identified by a qualified physician then a person is considered healthy. By this definition subtle impacts, like reduced functional capacity or increased susceptibility to disease are not a form of health damage because they do not reach the clinical severity that defines disease.

The Environmental Impact Statement conclusion, and therefore the document itself, does the community injustice because it does not accurately represent the health implications of the community's toxic exposure.

TSP-0003/001

The Environmental Impact Statement adopts a negative definition of health that classifies only severe clinical recognized forms of injury as health damaged. This is derived from the current medical perspective that defines health as the absence of diagnosed disease. If disease or damage has not been identified by a qualified physician, then a person is considered healthy. By this definition subtle impacts like reduced functional capacity or increased susceptibility to disease are not a form of health damage. Because they do not reach the clinical severity that defines disease. The Environmental Impact Statement conclusion, and therefore the document itself, does the community injustice because it does not adequately represent the

## Impact Evaluation

health implications of this community's toxic exposure.

### Response

The HSW EIS uses the best available data, computer modeling, assumptions, and related methods to produce estimates of reasonably foreseeable environmental impacts. The modeling approach was consistently applied to each alternative, and it provided information that allowed comparison of the alternatives.

The HSW EIS uses two exposure scenarios to evaluate the potential impacts to humans from solid waste management activities: industrial and resident gardener (agricultural). For waterborne pathways, an additional analysis has been performed for the resident gardener scenario to include a sauna/sweat lodge exposure pathway (indicated in the result tables of Volume II Appendix F as the hypothetical resident gardener with sauna/sweat lodge). These scenarios were chosen to represent a range of habits and conditions for potential exposures. The industrial and resident gardener scenarios are based on the recommendations presented in the Hanford Site Risk Assessment Methodology (HSRAM) as adopted by the TPA. These scenarios are based on the concept of reasonable maximum exposure as recommended by EPA for which the most conservative parameter is not always used. The resident gardener with a sauna/sweat lodge scenario also includes exposure to waterborne contamination used in a sweat lodge or sauna. The resident gardener with a sauna/sweat lodge scenario is only applied to waterborne pathways because the airborne pathways do not contribute to the sauna/sweat lodge exposure pathways. See Volume II Appendix F.

The HSW EIS comparison of human health and safety impacts among the alternatives is expressed in terms of worker dose, dose to the public from atmospheric releases, accidents during the operational period, and long-term impacts via the groundwater pathway in the post-closure period. The risks are expressed in many ways, including probability of latent cancer fatalities. Details of the analyses are provided in Volume I Section 5.11 and Volume II Appendix F.

Data on non-clinical health effects from radiological and chemical exposures are limited, and methods with which to model these impacts are generally not agreed upon.

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### Comments

TSP-0006/004

When the affects of mixtures of different chemicals are not known, are not analyzed, or taken into account. When affects on children. Possibly adults are studied. But the affects of various chemicals on children are not thoroughly considered. Or affects on the fish in the Columbia River, and the effects of dying fish will have on the Tribes and all the people along the banks down to the ocean.

### Response

Estimates of cancer risk in populations represent composites that account for the range in sensitivities of various members of the population, including children as well as adults.

Design features built in to the alternatives and potential mitigation measures discussed in Volume I Section 5.18 are developed to protect all people, including children, and the environment. For further information on radiation risk results for children can be found in Volume II Appendix F Section F.1.8.

Hazardous chemicals in MLLW have been characterized and documented since the implementation of RCRA at DOE facilities beginning in 1987. MLLW currently in storage, and MLLW that may be received in the future, would be treated to applicable state or federal standards for land disposal. Therefore, disposal of that waste is not expected to present a hazard over the long term because the hazardous constituents would either be destroyed or stabilized by the treatment. Inventories of hazardous materials in stored and forecast waste are either very small, or consist of materials with low mobility. See Volume II Appendixes F and G.

Inventories of hazardous chemicals in waste were not generally maintained by industries in the United States